Oceanographic Research Vessel USNS GIBBS (T-AGOR 1)

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13. ABSTRACT

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GIBBS is equipped to accommodate up to 24 scientists and allows them to perform many diversified tasks at sea. There is a large laboratory area, consisting of several compartments, on the main deck, which includes space for electronic equipment in addition to communication and navigation gear. There is a large variety of deck machinery to enable over-the-side handling of various types and sizes of payloads. The ship has large, open deck spaces, particularly on the stern, making it ideal for working and handling the experimental equipment.

GIBBS has carried out extensive research programs in many ocean areas, from Hawaii to the Arctic, from South America to the Mediterranean. It has been a valuable contributor toward the goals of increased knowledge of the sea and related physical phenomena.

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Work on the problem is continuing.

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OCEANOGRAPHIC RESEARCH VESSEL
USNS GIBBS (T-AGOR 1)

I. INTRODUCTION

The research vessel serves as the oceanographer's working platform and is one of the most important and expensive research tools. There is a large number and wide variety of vessels now being utilized. Some have been originally designed and constructed for research purposes, while others have undergone conversions from other types of vessels. The Naval Research Laboratory has the use of three such vessels, the USNS MIZAR (T-AGOR 11), USNS HAYES (T-AGOR 16), and the USNS GIBBS (T-AGOR 1). Information on the MIZAR and HAYES have been documented in other NRL reports. This report has been written to disseminate information about the GIBBS (Figs. 1, 2, 3).

The USNS GIBBS is of welded steel construction, 310 feet in length. Full load displacement is 2800 tons and her average speed is 14 knots. She was built in 1943 by Lake Washington Shipyard, Houghton, Washington as a seaplane tender, the USS SAN CARLOS (AVP 51). Conversion to a research vessel took place at Mobile Ship Repair, Incorporated of Mobile, Alabama, and the ship was placed in operation by the Navy on December 18, 1958. GIBBS is maintained and operated by the Navy's Military Sealift Command (MSC). MSC is the manager of Ocean Transportation for the Department of Defense and provides support ships for Arctic and Antarctic supply, Pacific supply, and research programs in hydrography and oceanography.

The ship was originally assigned as the principal research vessel of Hudson Laboratories of Columbia University at Dobbs Ferry, New York, under contract to the Office of Naval Research. Upon dissolution of Hudson Laboratories, July 1, 1969, the use of the ship and continuation of its research programs were transferred to the Naval Research Laboratory in Washington, D.C. The principal studies have been and will continue to be the study of physics and geology of the ocean, and of sound in the ocean, with the application directed toward the Navy's program of improving its submarine and anti-submarine warfare capabilities.

Professor Josiah Willard Gibbs (1839-1903), is generally considered to be one of America's greatest physicists. His work, unusual in 19th century America, in that it was concerned almost entirely with the purest of theoretical science, resulted in some of the contributions to fundamental knowledge in the physical sciences. His work is equally applicable to the problems of the ocean, the atmosphere, and physical and chemical processes in general. Gibbs, a professor of Mathematical Physics at Yale, was also an exceptionally gifted teacher, and two of his students won Nobel Prizes by following up his original research.

From what we learn about the ocean are developed all the techniques and systems of detecting, locating, classifying, tracking, and in some cases recovering submerged objects in the ocean. The GIBBS has made significant contributions in this field.

II. DESCRIPTION

A. Specifications

Length	310 ft 9 in.
Length at DWL	300 ft 0 in.
Beam	41 ft 1 in.
Draft	13 ft 6 in.
Freeboard	
Bow	19 ft 0 in.
Midships	12 ft 0 in.
Stern	13 ft 0 in.
Full Load Displacement	2800 tons
Light Displacement	1957 tons
Height, Keel to Mast	101 ft 0 in.
Cruising Speed	14 knots
Creep Speed	3-4 knots
Range	10,000 nautical miles
Endurance	30 days
Main Propulsion	
Fairbanks, Morse and Company Diesel	1600 HP
Complement	
Officers	11
Crew	33
Scientists	24
Home Port	Washington, D.C.

B. Ships' Complement

The USNS GIBBS is maintained and operated by the Military Sealift Command, Atlantic (MSCLANT), to provide services for the accomplishment of the scientific mission. Her 11 officers and 33 crewmen are all Civil Service employees of the U.S. Government. The positions comprising the ships' complement are as follows:

Deck Department:	Master	1
	1st Officer	1
	2nd Officer	1
	3rd Officer	1
	Radio Officer	1
	Boatswain	1
	Able Seaman	6
	Ordinary Seaman	3
Engine Department:	Chief Engineer	1
	1st A/Engineer	1
	2nd A/Engineer	1
	3rd A/Engineer	1
	Chief Electrician	1
	Plumber/Machinist	1
	Evaporator Utilityman	3
	Oilers	3
	Wipers	2

Steward Department:	Chief Steward	1
	Chief Cook	1
	Messman	4
	Steward Utilityman	5
	Cook-Baker	1
	2nd Cook	1
Purser Department:	Purser	1
	Yeoman/Storekeeper	1

C. Scientists' Living and Messing

Living quarters for the scientists are located on the second deck, between frames 85 and 121, directly below the lab areas. Accommodations are available for 24 scientists. There are a total of seven staterooms, including one for the Chief Scientist. A conference and day room is located adjacent to the living quarters on the starboard side. This room may be converted in an emergency to accommodate six additional bunks. Also located in the area are a scientists' office and dark room. A layout of the living quarters is shown in Fig. 4.

Messing facilities are shared with the officer contingent on the ship. The wardroom is located on the main deck at frames 44-54. A total of 24 officers and scientists can be accommodated at one sitting. Mealtime hours are as follows: 7:30 a.m. - 8:30 a.m. breakfast, 11:30 a.m. - 12:30 p.m. lunch, 5:00 p.m. - 6:00 p.m. dinner. The galley is located on the main deck at frames 82-87. A two-burner silex with coffee pot, a toaster, and a refrigerator with cold cuts and other sandwich ingredients are available 24 hours a day in the scientists data laboratory on the main deck.

A laundry room with an automatic washer and dryer is available to the scientists. A ship store is open to the scientists while at sea. Modest quantities of cigarettes, razor blades, and other articles are available. Recreation facilities available include daily movies, radio, library, and of course, fishing.

Scientists are required to participate in boat and fire drills. They are expected to know their lifeboat and emergency assignments along with the storage areas of life jackets.

D. Laboratory Areas (Fig. 5)

The Laboratory area is divided into several compartments extending from frame 87 to frame 116 on the main deck. These are the main Electronics lab, (Lab A), the Radio and Navigation lab, an auxiliary or secondary lab, (Lab B), a Mechanical Engineering lab, and a Data Analysis lab. In addition, a scientists' office, dark room, and machine shop for the scientists' use are located on the second deck, directly below the laboratory areas. All areas are air conditioned. Several storage areas are available for scientific equipment and will be described herein.

1. Main Electronics Lab (Lab A) (Fig. 6)

This compartment is located between frames 87-95, and is 16 ft × 28 ft in size. Foundations for 22 racks of electronic equipment are permanently installed. Racks can be easily secured in place by using specially designed hold-down clamps. The lab is supplied with regulated power which is described in another section of this report. Two work benches, each 30 in. × 60 in. are installed in the center of the room. A 36 in. × 36 in. hatch in the overhead permits easy access for loading equipment into the lab spaces.

2. Radio and Navigation Lab (Fig. 7)

This compartment is located between frame 95-105 on the port side and measures 20 ft × 14 ft, minus the ladder area which measures 12 ft × 3 ft. Included in this area is the scientific communications net equipment, and navigation equipment consisting of LORAN A and LORAN C, OMEGA system, Gyro repeater, UQN Fathometer, wind speed and bearing indicator, and a navigational plotting table. Satellite Navigation systems have been utilized whenever available and can be installed. A total of three rack foundations, accommodating six racks are permanently mounted in this area.

3. Auxiliary Lab (Lab B)

This compartment is located between frames 95-105, on the starboard side and is 16 ft × 14 ft in size. This space has rack foundations to accommodate six racks and a shelf bench 30 in. × 7 ft, 6 in., but is used mainly for storage of spare parts, both mechanical and electronic, which may be used on a particular cruise.

4. Mechanical Engineering Lab

This compartment is located between frames 105-116, on the starboard side and measures 18 ft × 14 ft. Included in this area are two work benches, and numerous drawers and shelves for stowing tools and fasteners. A large vice and drill press are mounted on one bench. A grinder is installed on the forward bulkhead. A fresh water sink and facilities for washing are located at the aft bulkhead. Much of the mechanical preparation and maintenance work is done in this compartment.

5. Data Analysis Lab

This compartment is located between frames 105-116 on the port side and measures 18 ft × 14 ft. This area contains a long work bench with storage shelves, and a work table and settee, which may be used for data analysis or general scientific paper work. Also included are a drinking water fountain, and a refrigerator and toaster for scientific personnel. This compartment can also be used to mount additional experimental equipment, if space is unavailable elsewhere.

6. Scientists' Office

This compartment is located midships on the second deck between frames 97-101 and measures 8 ft × 15 ft. It contains a long work table with storage shelves, and filing cabinets. A duplicating machine is also available in this compartment.

7. Dark Room

This compartment is located on the second deck, port side, between frames 97-103 and measures 11 ft × 7 ft. Included in this space are a stainless steel sink and filing cabinets. At the present, there are no photographic facilities in the room.

8. Machine Shop

This compartment is located on the starboard side, second deck, between frames 121-131 and measures 20 ft × 17 ft. The chief engineer and other designated crew members have access to the shop and have assumed the maintenance burden. Facilities include a lathe, bandsaw, drill press, grinder, vices, and work benches.

9. Storage Areas

(a) Boatswain Locker: This compartment is used for storing items used for various types of handling equipment accessories such as shackles, cable clips, eyebolts, thimbles, and slings. It is located just aft of the Laboratory on the main deck and measures 8 ft × 5 ft in size.

(b) Laboratory Storeroom: One storeroom is located on the second deck, portside, frames 121-131. This space is used for stowing some of the larger pieces of spare equipment which cannot be exposed to the weather. Some cables and floats may also be placed here. This compartment also contains the control panel and power unit for a deck-mounted winch. The room is serviced by an 8 ft × 8 ft hatch and a smaller hatch, and by the boat crane, making it an ideal place for storage.

Directly below this compartment is another storeroom, which can be serviced by the above hatches and a coinciding hatch in the overhead. Two powered reels are mounted here to stow larger quantities of cable. There is a larger shelf area on the port side for stowing additional equipment. This compartment also serves as the area for mounting air compressors used on various scientific operations.

(c) Battery Locker: This compartment is located on the 01 deck, starboard side, frames 78-84, and measures 12 ft × 7 ft. It is available for stowing various types of scientific gear and may also be used as an auxiliary lab area. The locker is equipped with an air conditioner.

E. Scientific Gear Handling Equipment

The following are listings of the scientific gear handling equipment available on GIBBS (Fig. 8):

1. Winches

(a) Deep-Sea Anchoring Winch
(b) New England Trawler
(c) Almon-Johnson
(d) Versus
(e) Hydrographic
(f) ORE
(g) Magnetometer
(h) Bathythermograph
(i) Warping Winch
(j) Bomb Winch

2. U Frames

(a) Stern
(b) Starboard

3. Booms and Davits

(a) Boat Crane
(b) Starboard Davit
(c) Starboard Gate Boom
(d) Towing Outrigger
(e) Ore Boom
(f) BT Boom
(g) Bow Davit

Detailed descriptions of these items are as follows:

1. Winches

(a) Deep-Sea Anchoring Winch System: This system is the workhorse of the ship inasmuch as it can perform a variety of tasks. It is used for deep-sea anchoring of the ship, as well as for hoisting or towing various types of underwater vehicles and payloads.

The system consists basically of a dual drum traction unit (Fig. 9), a stowage unit having two cable stowage drums with level-wind spooling features, the power unit, and a tension metering device. Each of these units is mounted on separate steel bedplates. The traction unit provides for hoisting and controlled payout of the cable. The stowage units perform the dual functions of stowing the cable retrieved by the traction unit and maintaining tension between stowage drums and traction unit while retrieving or paying out. The traction unit hydraulic drive consists of a variable displacement hydraulic pump and two fixed displacement hydraulic motors. The hydraulic drive for the stowage units is composed of a variable displacement hydraulic pump and fixed displacement hydraulic motor. A single electric motor is provided for driving the two pumps.

The traction unit is located on the main deck, center line, frames 139-142. The stowage drums and power unit are installed on the second deck, directly beneath the traction unit. A tensiometer for monitoring cable tension is located directly aft of the traction unit. The system is used in conjunction with the stern U-frame.

Characteristics include the following:

30,000 lb. pull at 133 FPM
8,800 lb. pull at 460 FPM
1st drum - 32,000 ft of 5/8 cable
2nd drum - 22,000 ft of 5/8 cable (with slip rings)
Electric motor - A.C., 150 HP, 440 V

(b) New England Trawler Winch (Fig. 10): This system is located forward on the 01 level at frame 31-38. It consists of two identical drums mounted on a common frame at 90° to each other. One drum is aligned fore and aft and can be used in conjunction with the bow davit. The other drum is aligned athwartships and is used with the davit on the starboard side. The hydraulic power unit consists of a variable hydraulic pump with manual control driven by a 40 HP electric motor, and including a 15 gallon reservoir and oil filter. A selector valve permits either hoist to be driven, but only one hoist at a time. The winch is most often used for velocimeter drops, coring, underwater camera, and other varied tasks.

Characteristics include the following:

10,000 lb. pull at 75 FPM
5,000 lb. pull at 150 FPM
2 drums - each 20,000 FPM of 1/2 in. cable (with slip rings)
Electric motor - 40 HP, 440 V, A.C.

(c) Almon-Johnson Winch (Fig. 11): This winch is located on the main deck at frames 120-126. The drums are aligned athwartships and operate in conjunction with the starboard U-frame. Various types of payloads are utilized with this unit, most frequently used to tow an acoustic source.

The drums are driven by an electric-hydraulic system, utilizing a 60 HP, 1800 RPM, electric motor. The complete power unit is located on the second deck, directly beneath the winch. The controls are located at the winch. There are two drums which can be operated independently by using a clutch. The system also includes a level wind.

Characteristics include the following:

10,000 lb. pull at 80 FPM
3,500 lb. pull at 160 FPM
Maximum light line speed 640 FPM
1st drum capacity - 5,500 ft 5/8 in. wire rope
2nd drum capacity - 16,000 ft 1/2 in. wire rope (slip rings)
Both drums engaged maximum line pull 10,000 lb.

(d) Versus Winch (Fig. 12): This is a self-contained, removable unit which is generally mounted on a reinforced section of the fantail, starboard side, frames 130-135. It is powered by an electric hydraulic drive which is mounted on the winch bedplate. It is used to hoist a variety of equipment, usually light loads with relatively short lengths of cable. It is equipped with a set of electrical slip rings.

Characteristics include the following:

Lifting capacity - 1,000 lb.
Drum capacity - 6,000 ft of 1 in. cable
Speed - 100 FPM

(e) Hydrographic Winch (Fig. 13): This unit is located on the starboard side of the 01 deck at frames 111-114. It is used primarily for taking sample casts, usually Nansen bottles or some other sampling devices. The drum is capable of handling 35,000 ft of 5/32 in. diameter hydrographic wire rope. The system is used in conjunction with a davit over the starboard side and a platform which swings out at main deck level and is used when attaching and removing bottles from the cable. The winch is capable of handling 1000 pounds at 450 ft/min, necessary for this type of operation. The unit is electric-hydraulic, incorporating a 15 HP, electric motor which drives a hydraulic transmission, including a variable stroke pump and a fixed stroke motor.

Characteristics include the following:

Electric hydraulic - 15 HP
Cable capacity - 35,000 ft of 5/32 in. wire rope
Load capacity - 1,000 lbs. of 450 FPM
Maximum load - 1,500 lbs.

(f) ORE Winch: This winch is located at frame 121, main deck, and operates in conjunction with the port boom. It is a special purpose unit, installed to accommodate the towed ORE fathometer. The power unit for the Almon-Johnson winch is used to power this unit. 50 FPM, 1,000 pound pull, 1,000 ft of 1/2 in. cable are its characteristics.

(g) Magnetometer Winch: This unit is located at frame 127, main deck, operates with the starboard outrigger. It was installed to handle a magnetometer, and also gets its power from the Almon-Johnson drive. The characteristics are: 50 FPM, 1,000 lb. pull.

(h) Bathythermograph Winch: The ship is equipped with a standard bathythermograph system consisting of a BT winch and gate-type boom. The winch and boom are located at frame 131 on the port side, main deck.

(i) Warping Winch: An electric warping winch with dual heads is located on the main deck, starboard side, at frame 118. It has a 6,500 pound pull at 20 FPM and can be used to maneuver or hoist scientific equipment if necessary.

(j) Bomb Winch: This winch, formerly used for bomb handling, and now used for cargo is located on the 01 level, starboard side, frame 44. It has dual heads and a 2,000 pound capacity at 20 FPM, and can be used for maneuvering or hoisting scientific equipment.

2. U-Frames

(a) Stern: This unit is located on the centerline and operates in conjunction with the Deep-Sea Anchoring winch. The U-frame is capable of supporting 30,000 pounds static tow line pull when in the outboard position at 45° above the horizontal, when the towing pull is perpendicular to the plane of the U-frame. It has an outreach of 7 ft over the stern when in the outboard position. The U-frame is provided with two hydraulic cylinders capable of driving the frame from the outboard position to an inboard position 45° above the horizontal, against a torque of 60,000 ft lbs. The head of the frame can support a 6,000 pound load during its 90° of travel. Two outboard stops are provided.

The hydraulic pump and electric motor are installed below the main deck with watertight controls mounted at the port support pedestal about 3 ft above the main deck. The pump is 1,000 PSI, 5 GPM capacity vane type to give a 30 second travel time. The motor is 450 V, A.C., 1200 RPM. There is an automatic cut-off at the end of the U-frame travel.

(b) Starboard: This unit is located at frames 120-125 and operates in conjunction with the Almon-Johnson winch. The U-frame is similar to the stern system, with two hydraulic cylinders driving the frame. The power unit is below decks. Stops are provided in both inboard and outboard positions.

Characteristics include the following:

Static test against stops - 15,000 lbs.
Head room - 13 ft 0 in.
Between uprights - 9 ft 0 in.
Proof test - 6,700 lbs.
12,000 lbs. maximum at 2,000 PSI

3. Booms and Davits

There are a number of booms and davits for handling electronic gear at different locations on the ship. They are as follows:

(a) Boat Crane: The crane is ship's equipment but has been made available for loading scientific equipment to the laboratory and also for handling over-the-side equipment. Crew members only are authorized to operate it.

The unit is on the centerline at frame 108, and its 34 ft boom enables it to service the laboratory, and the storage areas both on deck and below deck. It has a reach of 14 ft over-the-side. The capacity of the crane is 30,000 lbs. and the decks have been stiffened to withstand the load.

(b) Starboard Davit: This unit operates in conjunction with the aft drum of the New England Trawler winch and is located on the 01 level at frame 38. The davit is powered hydraulically and has an outreach of 8 ft and a load capacity of 10,000 lbs. A hinged platform is provided to facilitate the launching and retrieving operation.

(c) Starboard Gate Boom: This unit is located on the 01 deck at frame 114 and operates with the hydrographic winch. It is also equipped with a hinged platform at the main deck level. The boom has a capacity of 1,500 lbs. and an outreach of 8 ft.

(d) Towing Outrigger: This is a gate type boom which was installed on the starboard side, main deck aft, to tow an air gun source. It has an outreach of 12 ft and a load capacity of 2,000 lbs.

(e) ORE Boom: This boom is installed on the port side at frame 116, on the existing boat launching kingpost. It was installed specifically to tow an ORE fathometer. It has a load capacity of 1,200 lbs. and an outreach of 15 ft when backstayed perpendicular to the ship. A similar boom is located forward on the 01 level and is used for loading ship's stores.

(f) BT Boom: This is a standard bathythermograph gate boom and is used in conjunction with the BT winch. It is located on the port side, main deck, frame 131. It has a reach of 8 ft, and a working load of 1,200 lbs.

(g) Bow Davit: This is a stationary davit mounted on the main deck on the bull nose. It has been used for taking cores off the bow and for other special uses. It has a capacity of 10,000 lbs. and an outreach of 3 ft.

F. Power Distribution System

The following is a description of the electrical power plant aboard the USNS GIBBS. The discussion covers the operation at sea, while in port, and for silent ship operation.

The vessel is equipped with two 200 KW generators, two 100 KW generators, and two 25 KW generators. The plant is operated with one 200 KW generator while in port, while at sea, it is operated as a split plant. In effect, there are two plants in operation as the 200 KW and 100 KW units operate independently of each other. Each generator puts out 450 volts, 3 Ø, 60 KHz.

All heavy duty electric motors and equipment operate on 450 volts, off the 200 KW generators. One 100 KW unit is used for the 120 volt lighting and essential power distribution. Consequently, the voltage fluctuations created by the operation of the heavy duty equipment will not cause fluctuations in the lighting and essential power.

Power to the laboratory is supplied from a 100 KW unit through a switchboard which also ties in the two 25 KW generators. From the switchboard, power is fed through step down transformers, delta-Wye connected, 440/208/120, to six solatron voltage regulators, which produce ±0.5% regulation. From here the controlled power is fed to a switchboard in the laboratory, where it is distributed through circuit breakers to receptacles which serve the scientific equipment. The following power is available at the switchboard: 120 V, 3 Ø, 60 Hz; 120 V, 1 Ø, 60 Hz; 208 V, 3 Ø, 60 Hz; and 208 V, 1 Ø, 60 Hz. 440 V, 3 Ø, 60 Hz is also available in the Laboratory (Fig. 14).

The Radio-Navigation Lab and Mechanical Lab areas are fed through separate 440 V - 120 V transformers. This power is unregulated. In addition, the laboratory area includes a 120 V, single phase, 400 Hz supply, which is obtained by tapping off the forward distribution panel through a frequency converter. Also available in the lab is a 120 volt D.C. supply.

The two 25 KW generators are used when the ship is required to assume silent operation. The condition may be required to reduce random noise to a minimum due to the nature of a particular experiment. In order to accomplish this, all machinery is

stopped and the shock mounted generators, encased in a soundproof compartment are activated to supply the ship with essential power and power for the scientific laboratory equipment.

G. Communications

Scientific Radio System on the ship consists of the following: The scientific radio station aboard the GIBBS is a mobile unit of the NRL scientific radio communication system. Its primary function is to provide a means of obtaining logistic support for the scientific personnel embarked on the ship during NRL operations.

The Laboratory utilizes three different categories of communications circuits. The ship maintains daily schedules with the Laboratory on the logistics circuit. When GIBBS is operating with another ship, or with a land-based facility, information related to the operation in progress is transmitted, usually on a different frequency which is referred to as the command circuit. Logistics information is not normally passed on this circuit. Scientific data are processed for radio transmission and are sent and received over a data circuit during two-ship and ship-to-land operations. This circuit is not normally used for voice transmissions.

The entire system is authorized to operate on five single-sideband frequencies and on four VHF FM frequencies. The selection of frequencies for use on a particular net is determined by the great circle ship-to-ship or ship-to-shore distances involved. The GIBBS scientific radio station is installed, maintained, and operated by NRL personnel and is not connected with the ship's radio system (Fig. 15).

The radio station equipment is installed in two Premier six-foot rack cabinets which are located in the Navigation Laboratory. A writing surface attached to the front of the racks at desk height completes the console. The equipment consists of two Collins KWM-2/30L 1 single sideband systems. Each is connected through a directional wattmeter and an antenna coupler to a vertical antenna. The vertical antennas are mounted on the port and starboard gun mounts at the 02 level. A Collins model 30S1 linear amplifier is mounted to the left of the radio console on the deck. This unit can be connected to either of the KWM-2 transceivers for increased power output. The power output of the 30S1 is 1 KW; the output of the 30L 1 is 500 watts. The third SSB system is a one kilowatt unit (CAI CA-27 SSB transceiver CAI CL-3 linear amplifier). This unit with its associated antenna coupler is located in the auxiliary radio room on the 03 level. It is connected to a long wire antenna. The control and monitor panels for this system are located in the left console rack in the Navigation Lab. A Motorola VHF FM transmitter-receiver is mounted in the console cabinet as is a Hammarlund communications receiver. The FM set is connected to a coaxial antenna which is mounted on the guard rail at the 01 level port side aft. The FM unit is used for close range ship to ship communication, and data transmission. The Hammarlund receiver is used for general purpose monitoring.

The power capability of the station is 500 watts and 1000 watts peak envelope power in the single sideband mode and 30 watts in the FM mode. The station can monitor four frequencies simultaneously but is designed to transmit on one frequency at a time.

To date, the GIBBS radio station has been capable of communicating with the Laboratory from all operating areas. The flexibility of this station is increased by the use of a telephone patch circuit, which has been installed in the system at NRL. Once radio contact has been established, the ship can communicate with any point in the world where a telephone line is available. The telephone patch can also be connected to the Autovon network. The system is authorized to operate at a power output of 1000 watts, and the output of the GIBBS radio station can be increased to that level if necessary.

A complete description of the NRL scientific radio communication system is the subject of a separate NRL document currently under preparation.

The ship is also equipped with an intercom system which provides high level voice communication between seven critical areas:

(a) New England Trawler Winch
(b) Starboard Work Area
(c) Laboratory
(d) Almon-Johnson Winch
(e) Deep-Sea Winch
(f) Deep-Sea Winch Stowage
(g) Hold Stowage Area

The stations are weatherproof University Housings with 30 watt ruggedized speaker elements. With all seven stations operating, it will provide up to 12 watts per station with a 100 watt amplifier as the core of the system. Any station can originate and talk to all other stations. Unused stations can be electrically cut out at will.

H. Navigation

On all at-sea operations, it is necessary to be aware of the ship's location, and in most cases, a reasonably accurate position must be determined. GIBBS is equipped with three different navigational systems, all located in the scientific Radio-Navigation Laboratory. They are briefly described as follows:

1. LORAN C

The LORAN C system, deriving it's name from the words "long range navigation" was developed during World War II to serve as a precise long range navigational aid for military operations.

Operation of the LORAN system of navigation is based on the difference measurement of the time of traverse of radio signals between two transmitters, the locations of which are known, and a single receiver. Since the velocity of radio waves is essentially a constant, the measurement of time difference can be simply interpreted in terms of distance difference.

LORAN coverage is available throughout much of the ocean area of the Northern hemisphere. Accuracy of fixes are approximately one fourth of a nautical mile.

2. OMEGA VLF

The OMEGA system offers the opportunity of global navigation with relatively few transmitters. This navigation system, as proposed by the U.S. Navy, will ultimately comprise eight transmitters. Currently, four are in operation, giving a useful capability for many important geographical regions.

OMEGA navigation is based on the measurement of phase of the signals from each of the several stations. It is not possible to transmit sharp pulses of the type used in LORAN. OMEGA is best described as a time-shared CW type of radio navigation system in which the measurements are in terms of the relating phase of the received signals, rather than the time-of-arrival of pulses. Anticipated accuracy is in the one to two nautical mile range.

3. Satellite Navigation

GIBBS is equipped with a system which provides continuous, real-time navigation by receiving and processing Navy navigational satellite transmissions and combining this information with data from external velocity sensors. The system consists of two units: a mast group containing an antenna, pre-amplifier, and cable, and an electronics group which incorporates a Magnavox satellite receiver and a Hewlett-Packard computer.

The Navy navigation satellite system (NNSS) has been in use since 1964. The system consists of a group of satellites in polar orbits at altitudes of 600 nautical miles which broadcast a constantly updated signal giving time and location. The user measures the doppler shift in the satellite's broadcast radio signal as the satellite moves along its orbital track. The system gives hourly coverage on a world-wide basis. Accuracy expected is one-tenth of a nautical mile.

I. Deep-Sea Anchoring

A deep-sea anchoring capability is extremely useful when performing scientific experiments at sea. An anchored ship provides a relatively stable, non-drifting platform, which reduces station keeping problems considerably. Oceanographic and acoustic instrument systems lowered from an anchored ship are subjected only to current drag forces on the systems themselves and are not dragged by a drifting ship on which both wind and current act.

The GIBBS was involved in an extensive amount of pioneering deep-sea anchoring work during the 1960's. The ship was anchored successfully nearly 100 times during that period under various types of conditions and at different ocean depths. Cables of various sizes and construction were utilized and a large amount of useful data accumulated. Successful anchoring was achieved at depths ranging from 950 feet to 23,700 feet.

The ship is anchored using the deep-sea anchoring winch system on the stern consisting of the traction unit, the dual drum stowage unit, the tensiometer, and the stern U-frame. Actual operation is conducted by Laboratory personnel.

III. CONCLUSION

The USNS GIBBS has been a valuable tool for conducting oceanographic research since its conversion, both for Hudson Laboratories and the Naval Research Laboratory. Through the improvement of existing facilities, and the addition of new equipment, it has become one of the nation's most versatile research ships. Its various laboratory areas and array of handling equipment, as well as its ample open deck spaces, make it ideal for conducting various types of experiments. GIBBS has an impressive history of studying the oceans, and has contributed greatly toward the nation's understanding of the sea and its many mysteries.

Fig. 1 - USNS GIBBS

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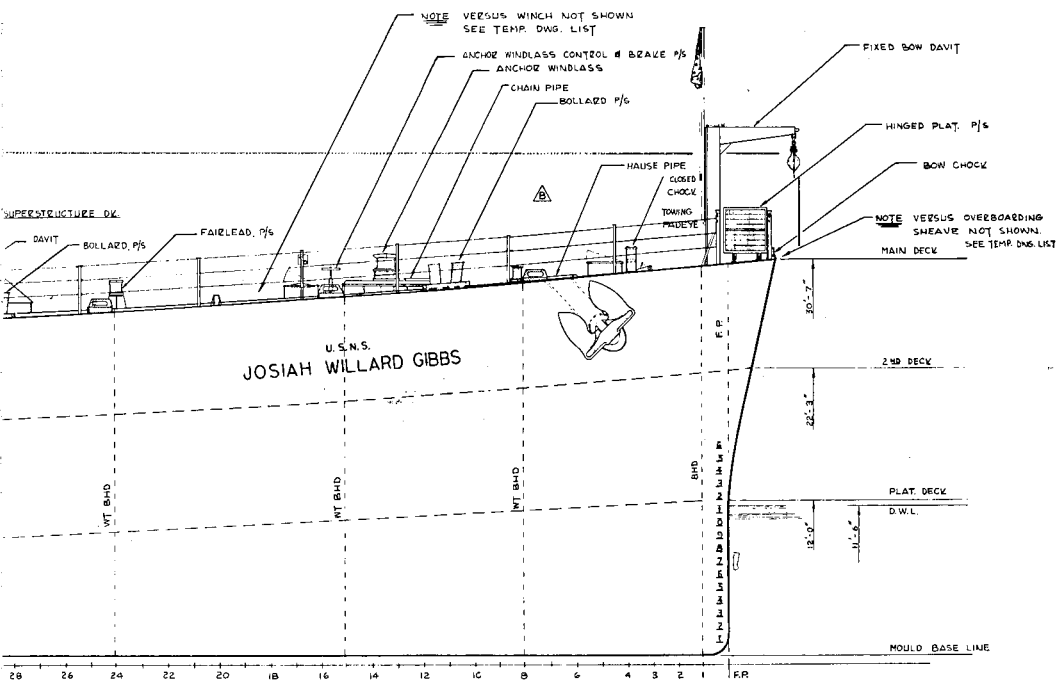
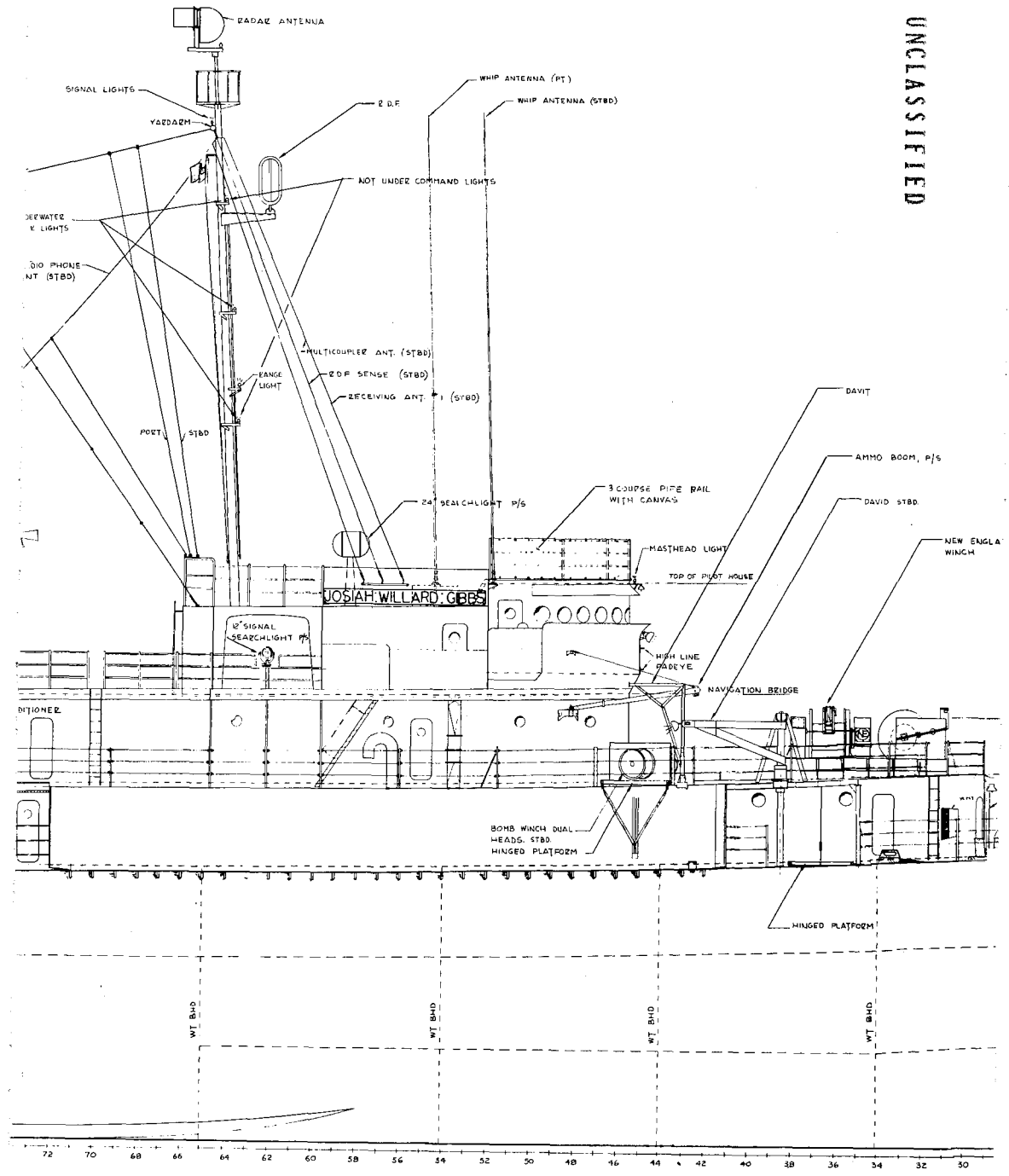
JD TRAWLER





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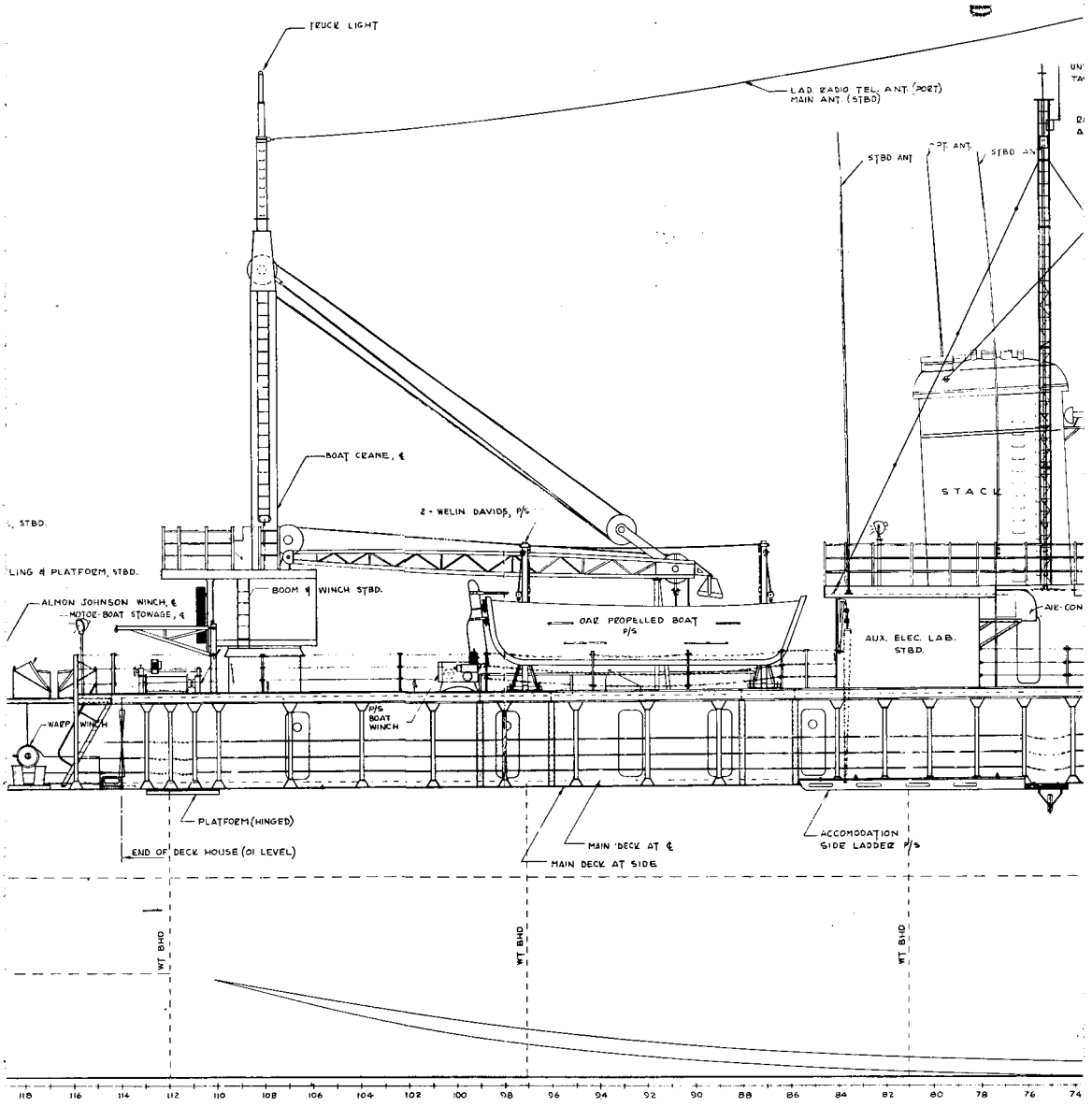
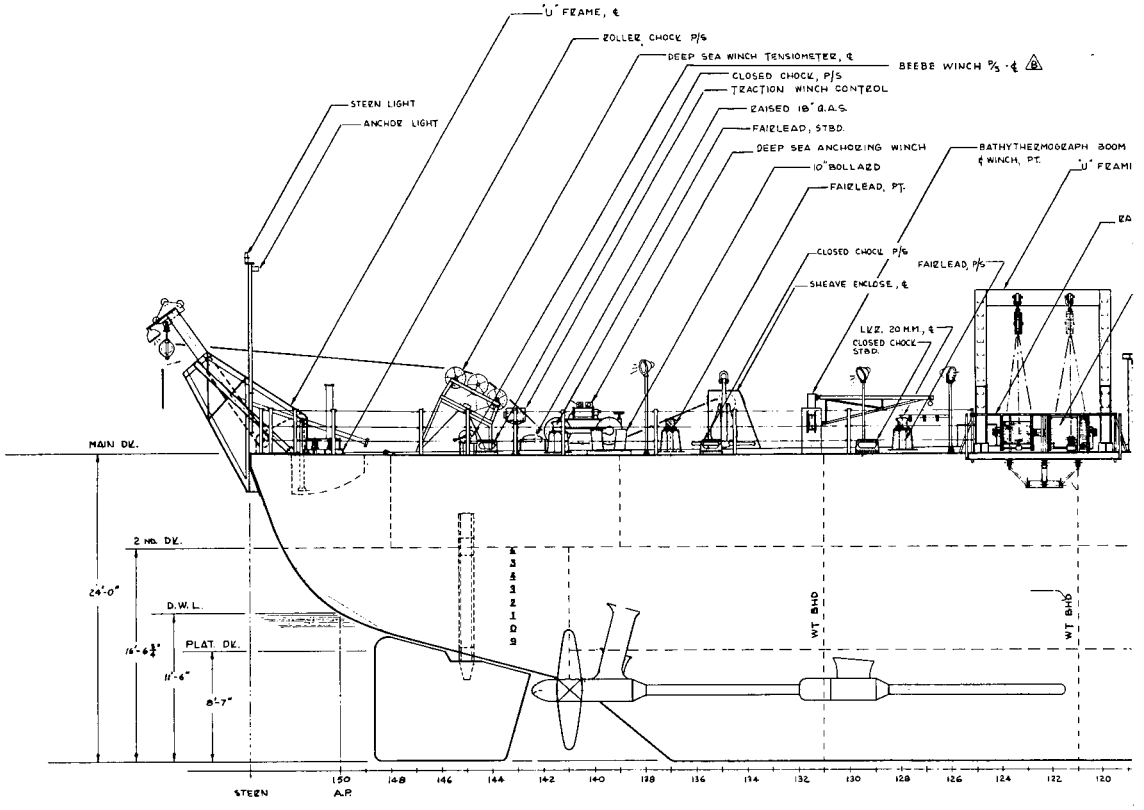


Fig. 2 - Outbo



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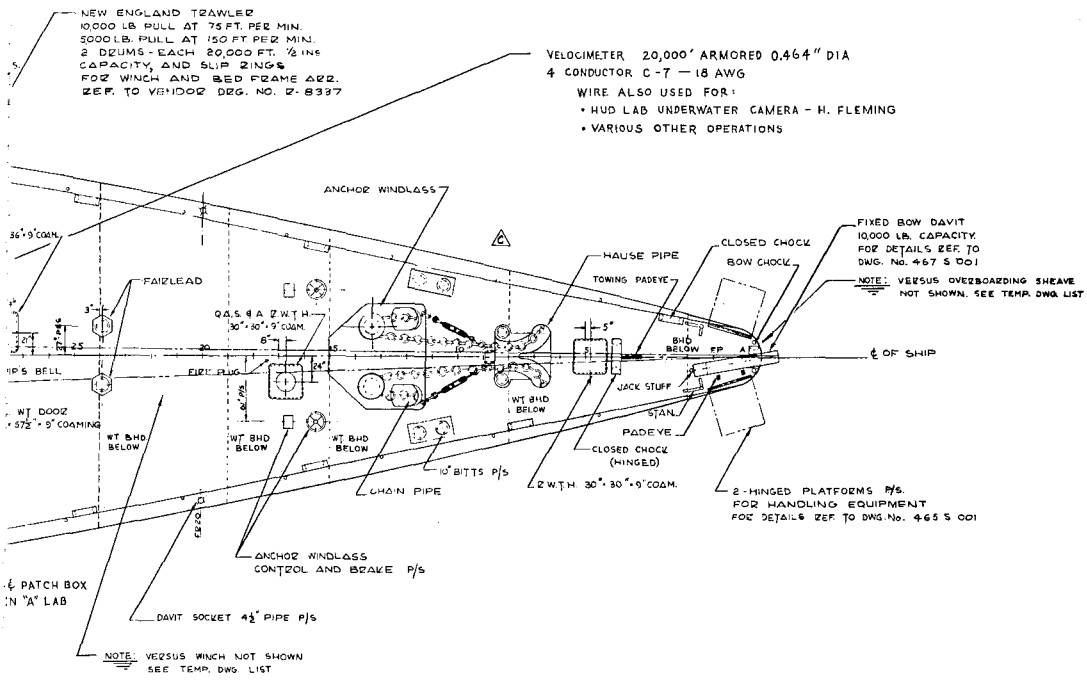

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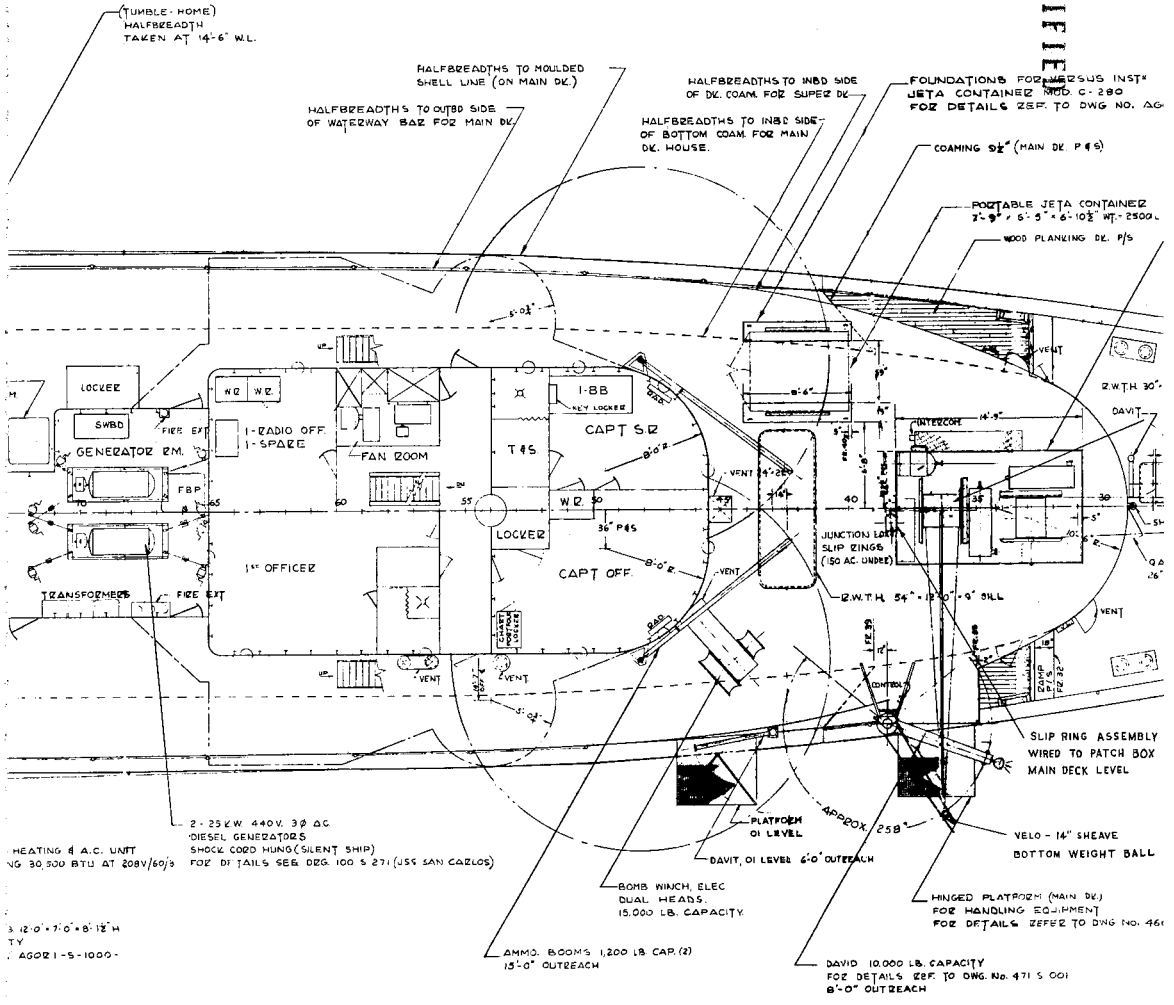

and 01 decks

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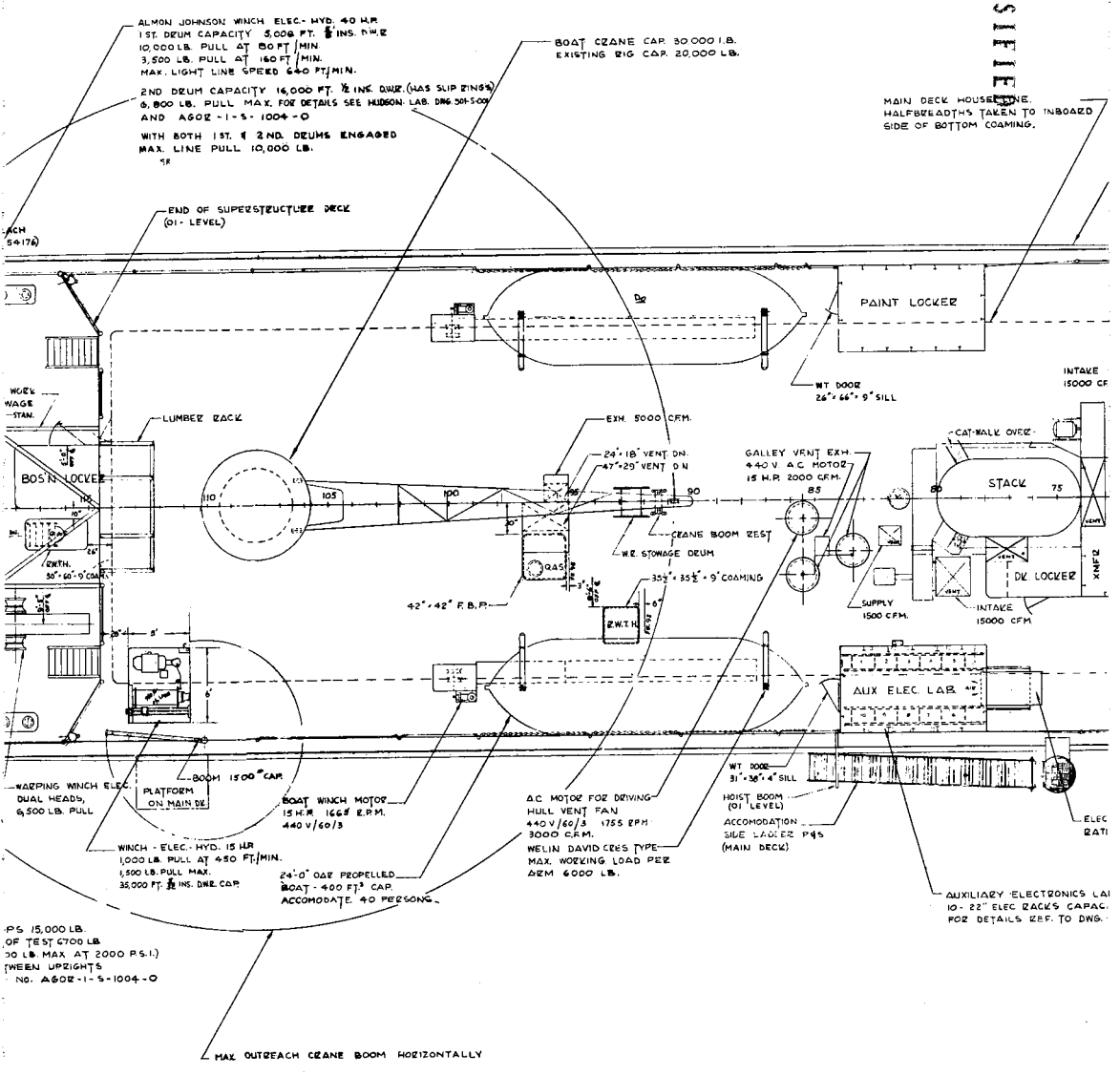

Fig. 3 - Superimposed main

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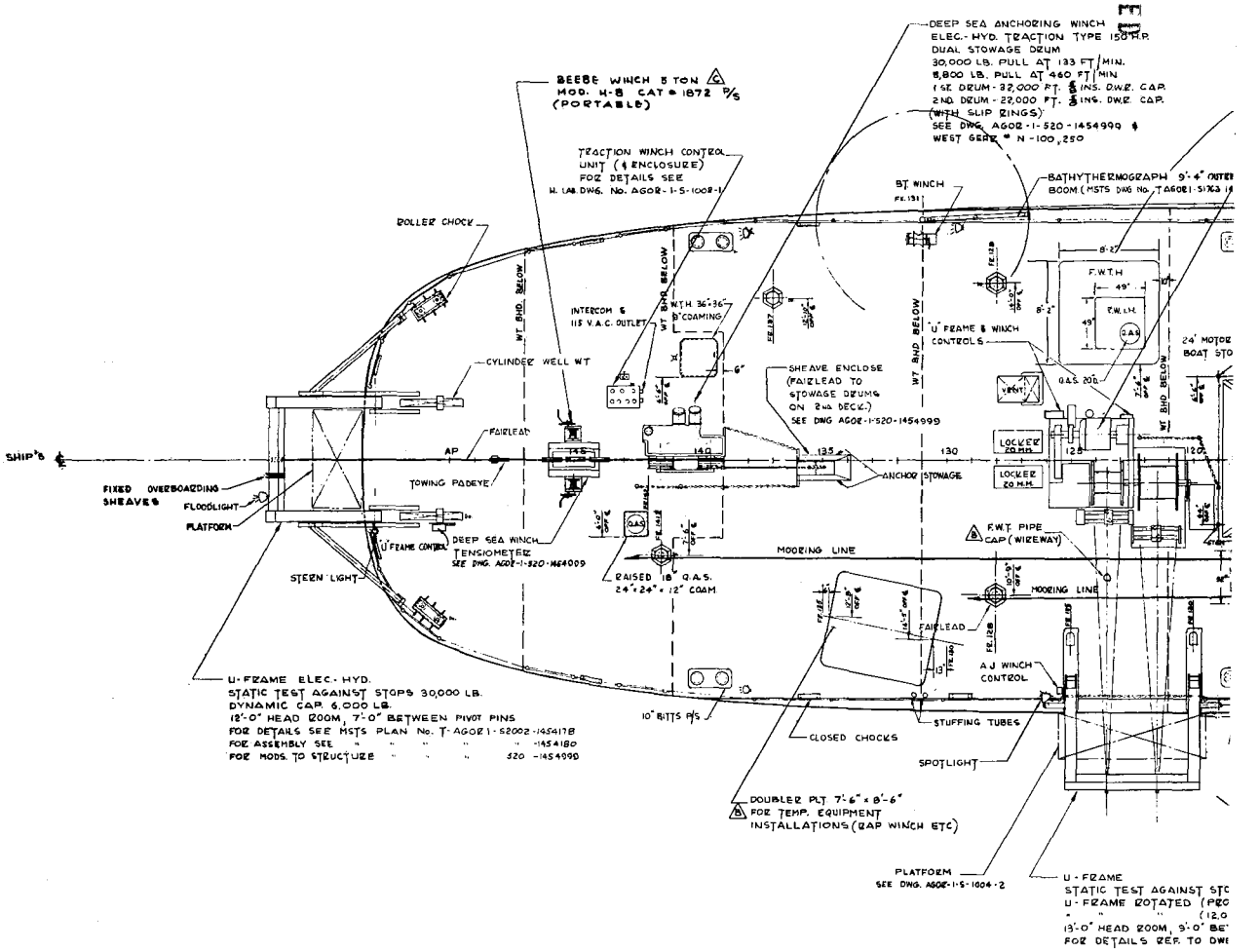

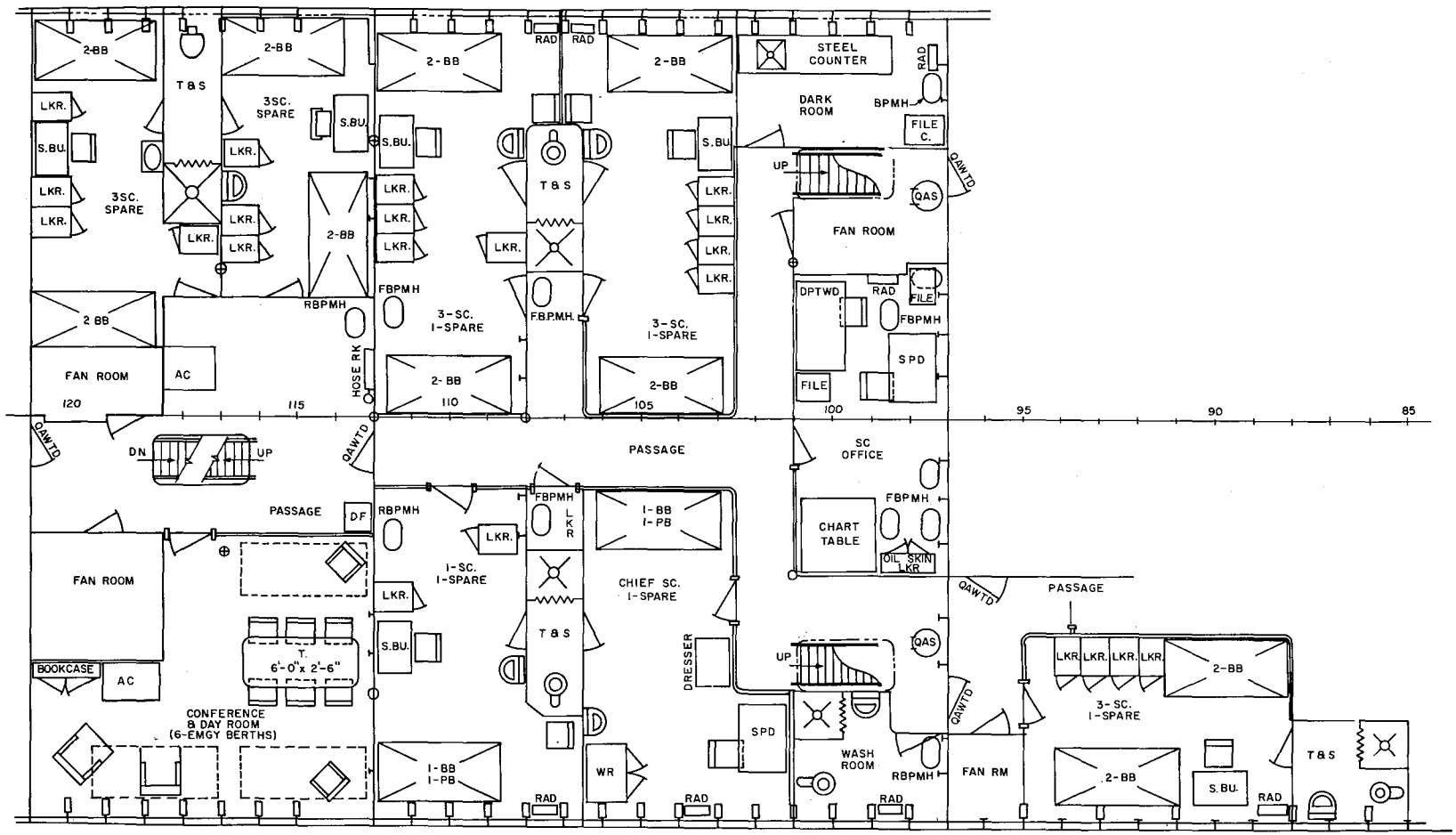

Fig. 4 - Scientists berthing area

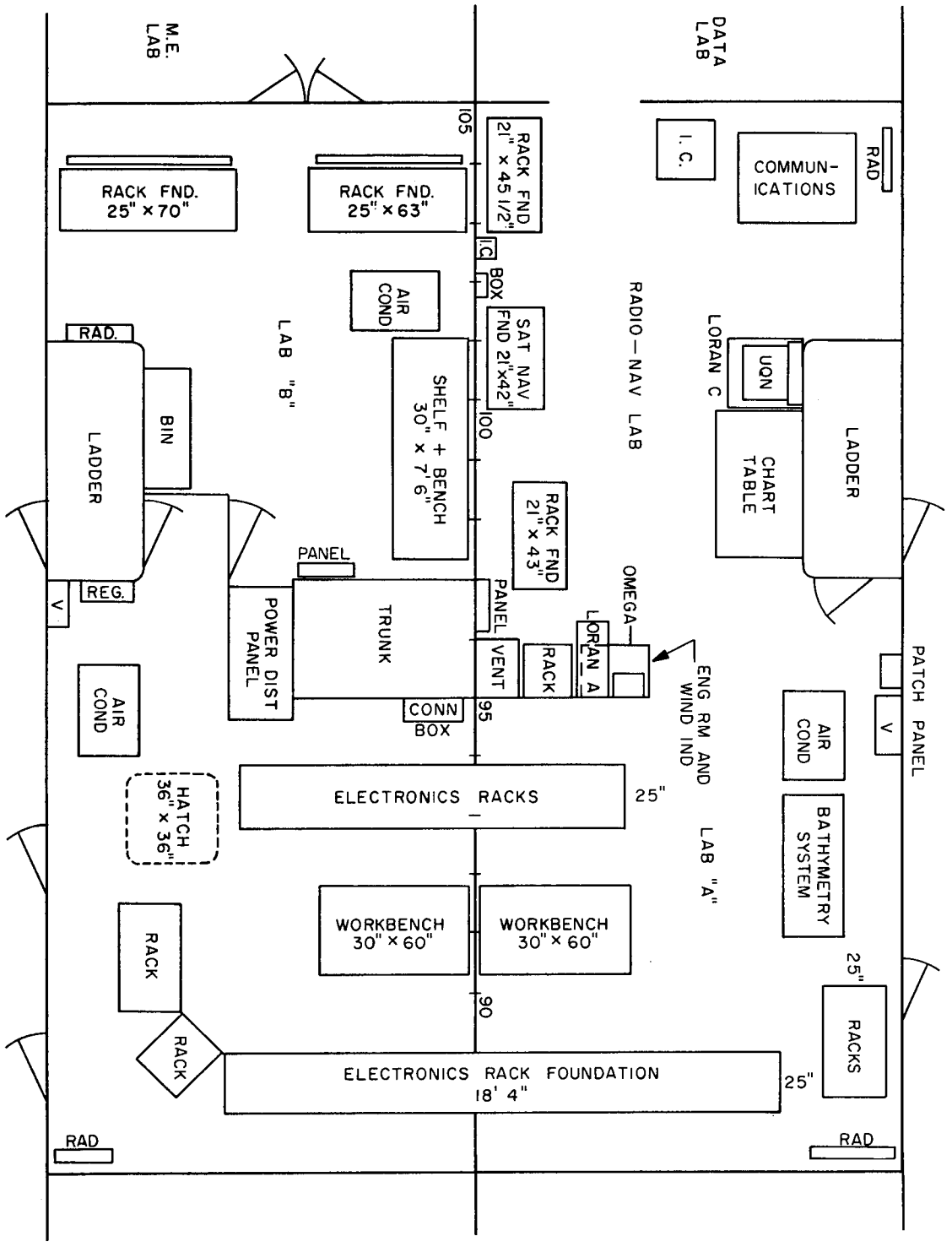

Fig. 5 - Laboratory areas

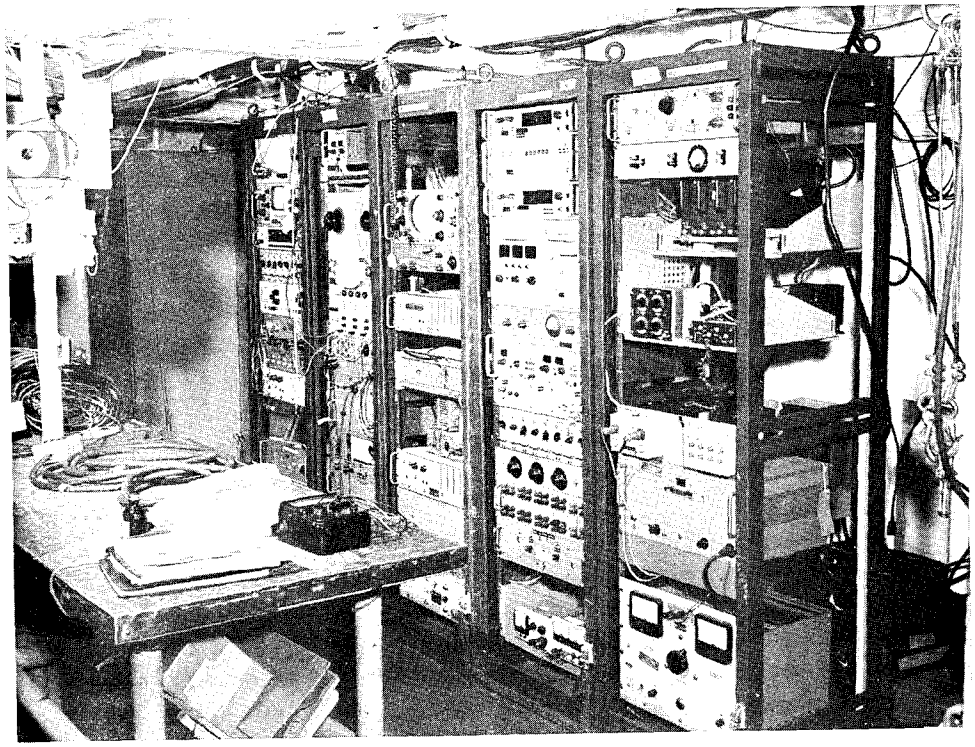

Fig. 6 - Typical lab installation

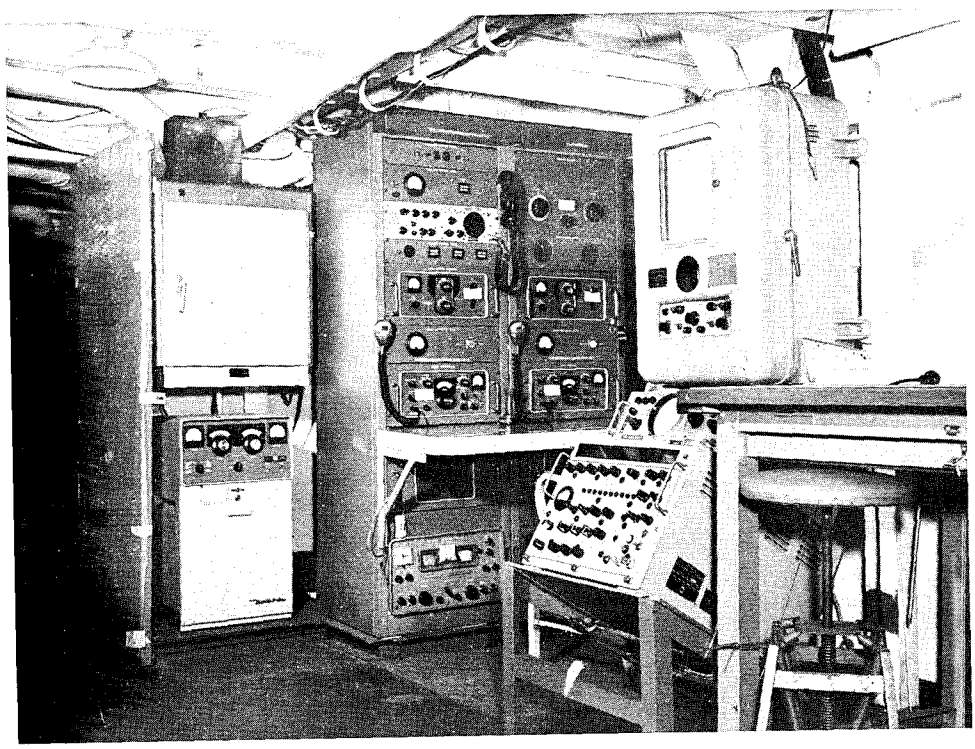

Fig. 7 - Radio-navigation lab

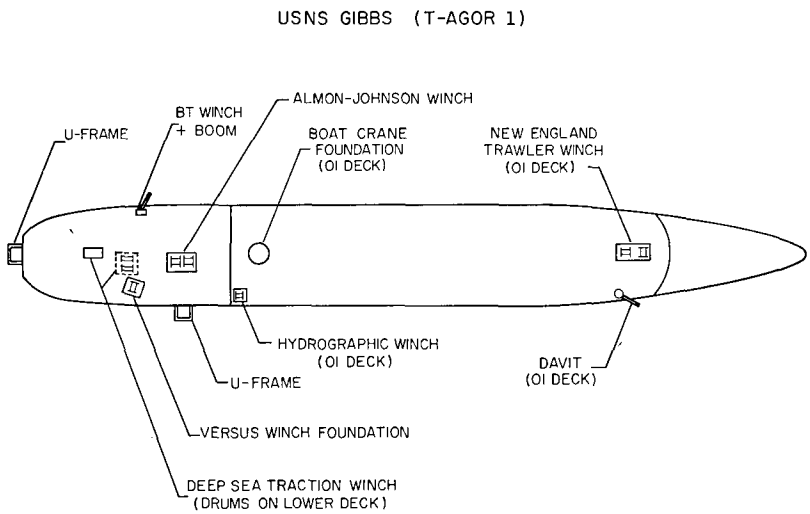

Fig. 8 - Deck layout of major handling gear

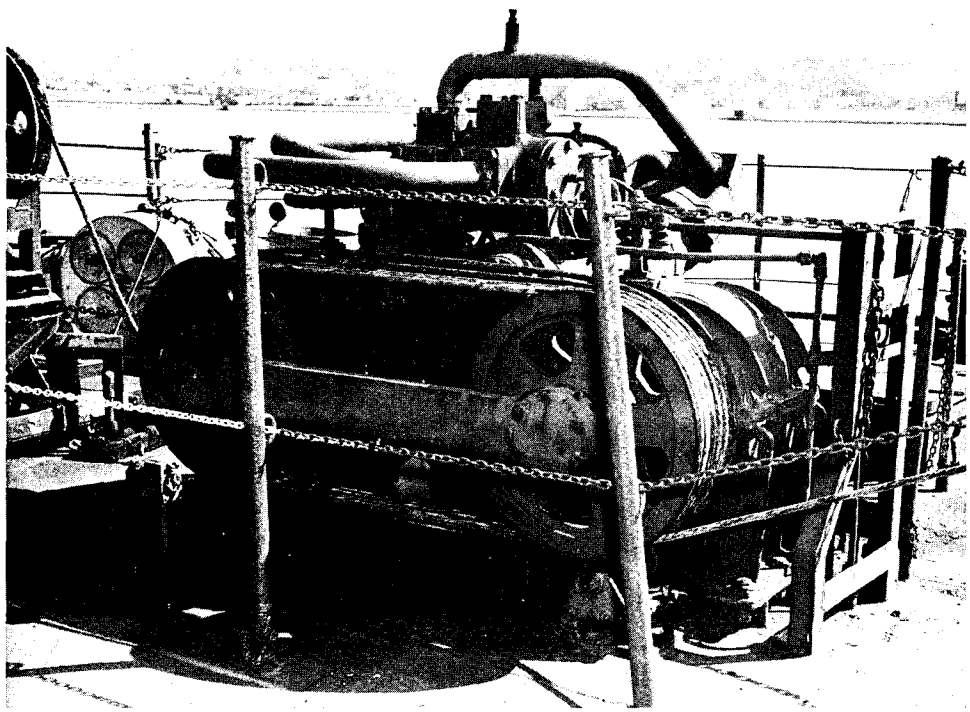

Fig. 9 - Deep sea winch traction unit

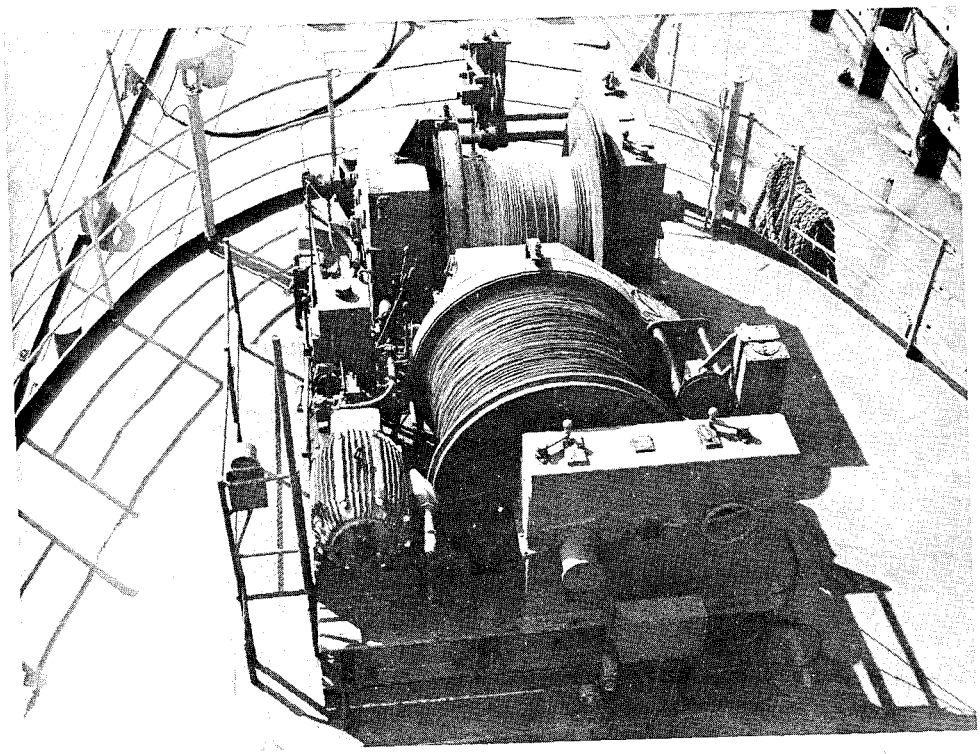

Fig. 10 - New England trawler winch

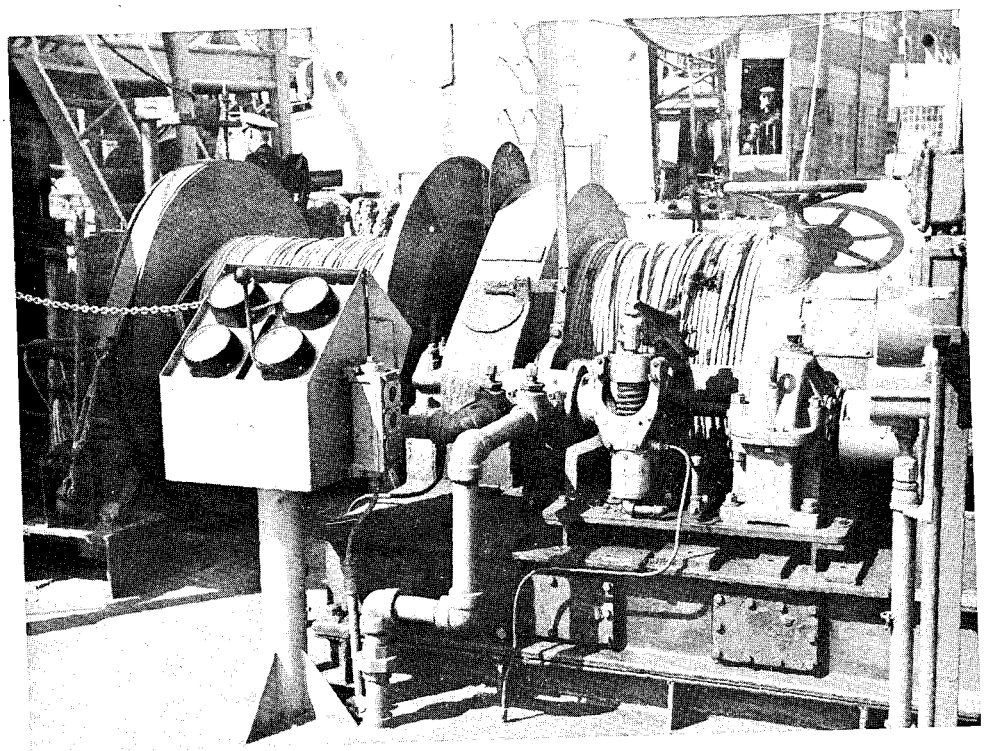

Fig. 11 - Almon-Johnson winch

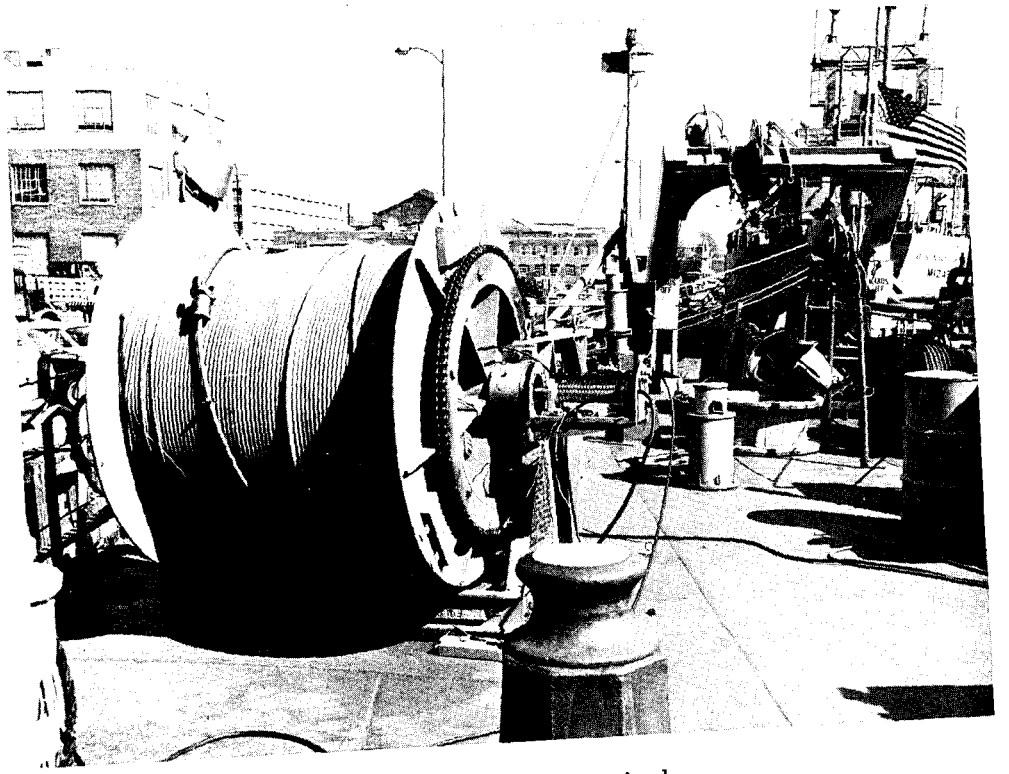

Fig. 12 - Versus winch

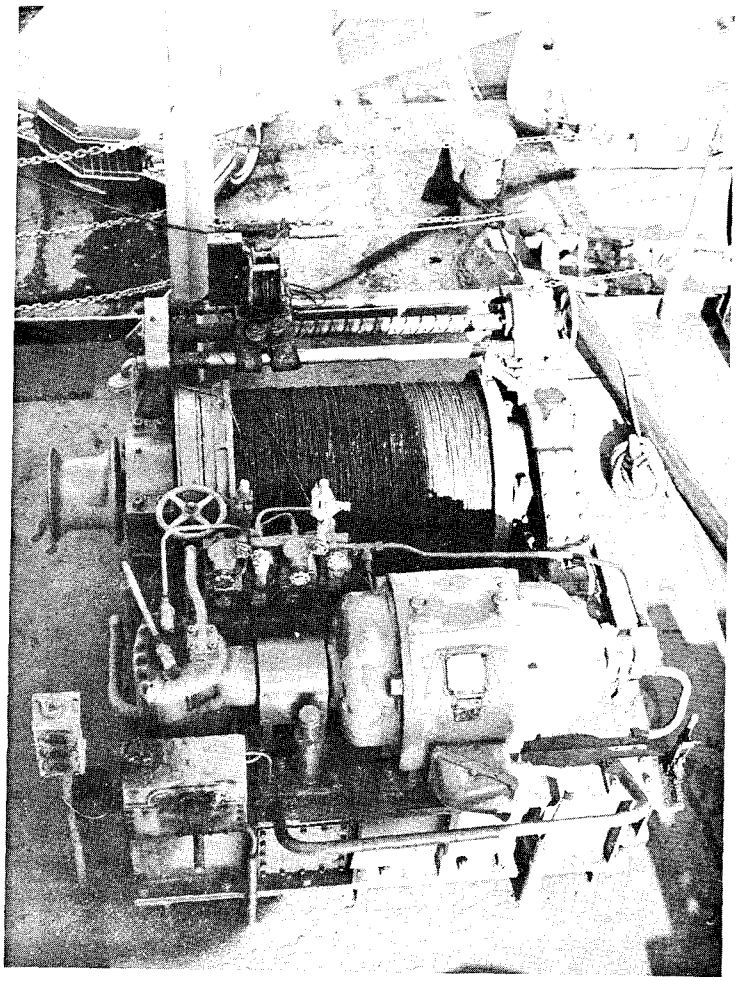

Fig. 13 - Hydrographic winch

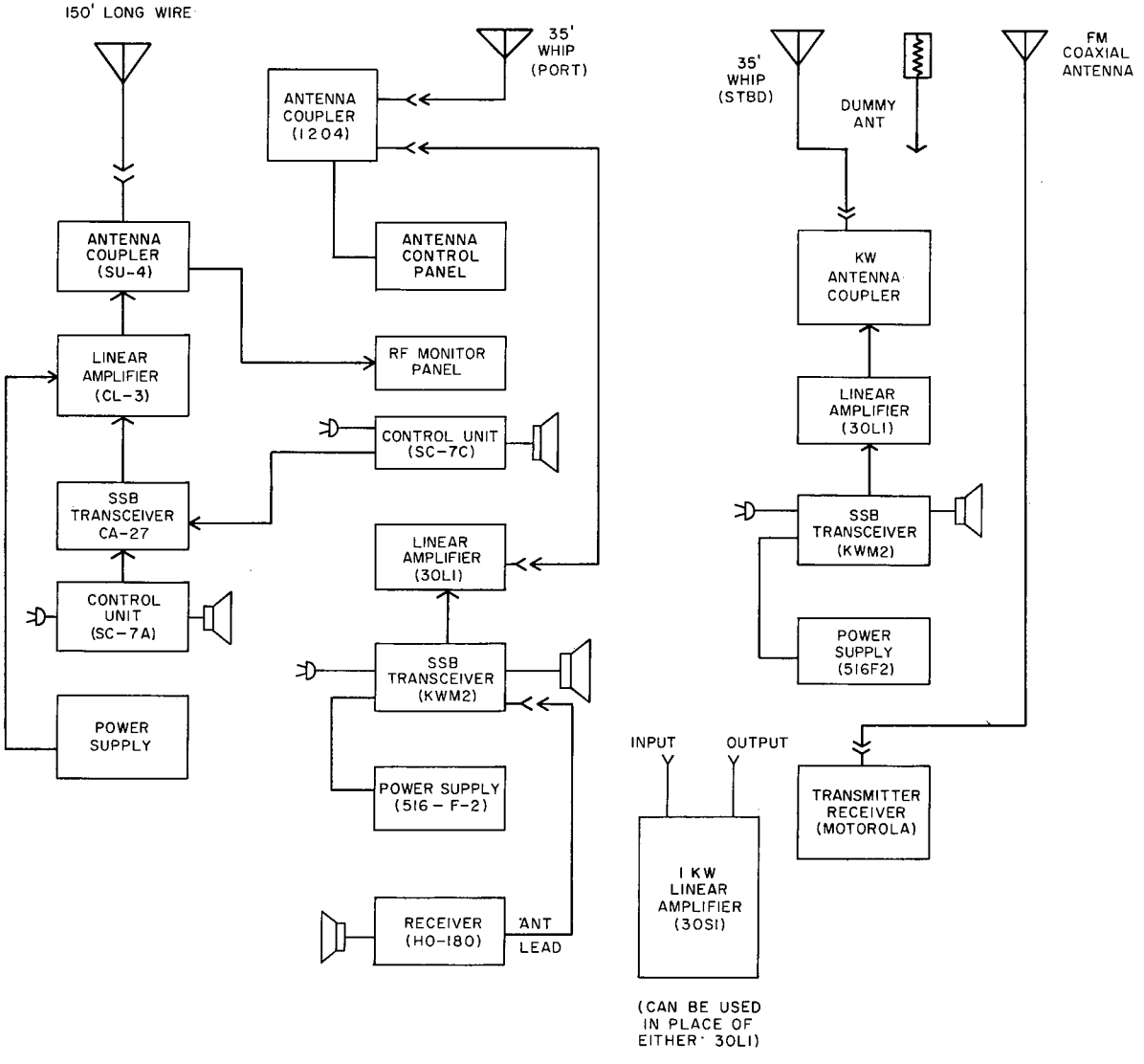

Fig. 15 - Scientific radio station block diagram

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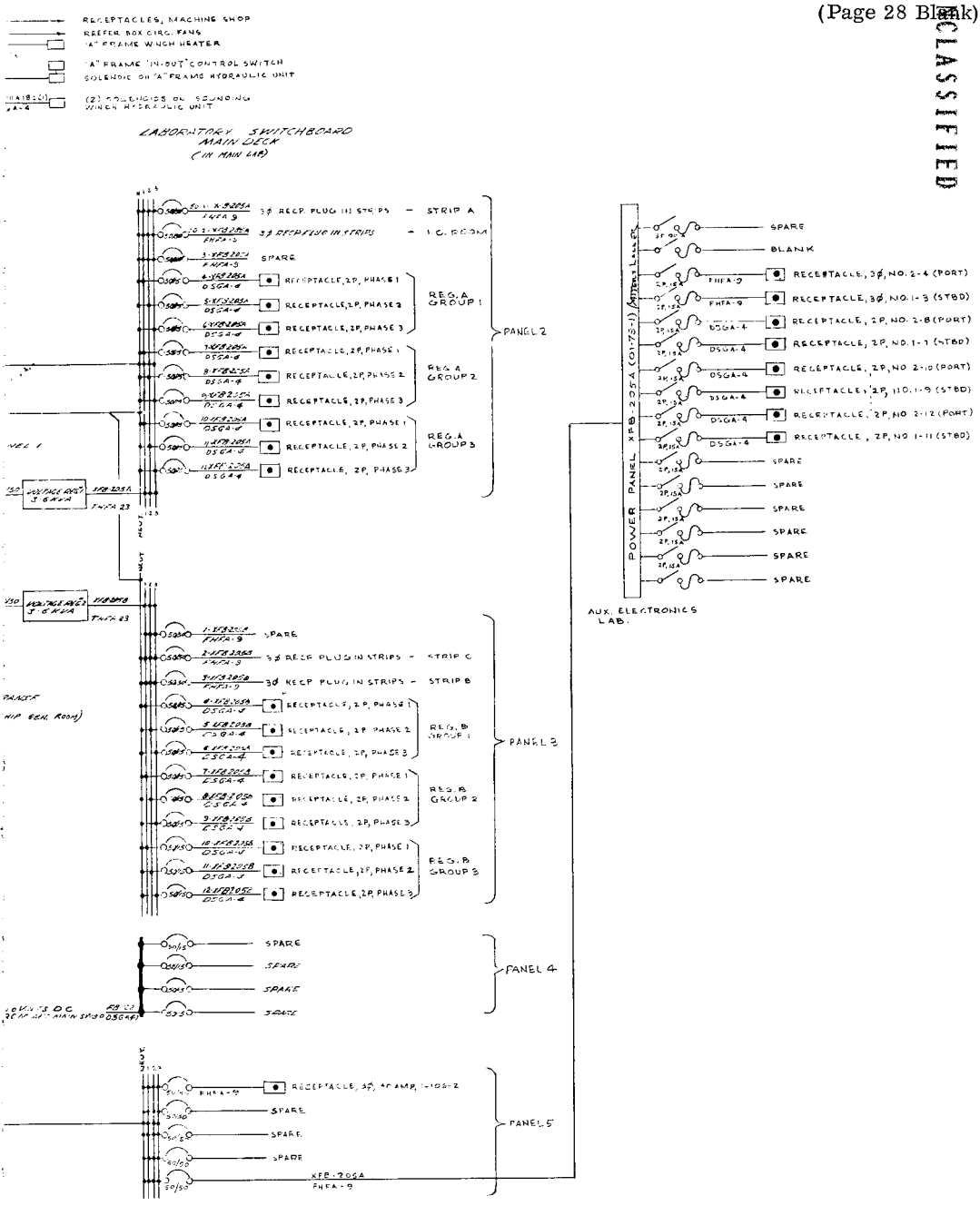
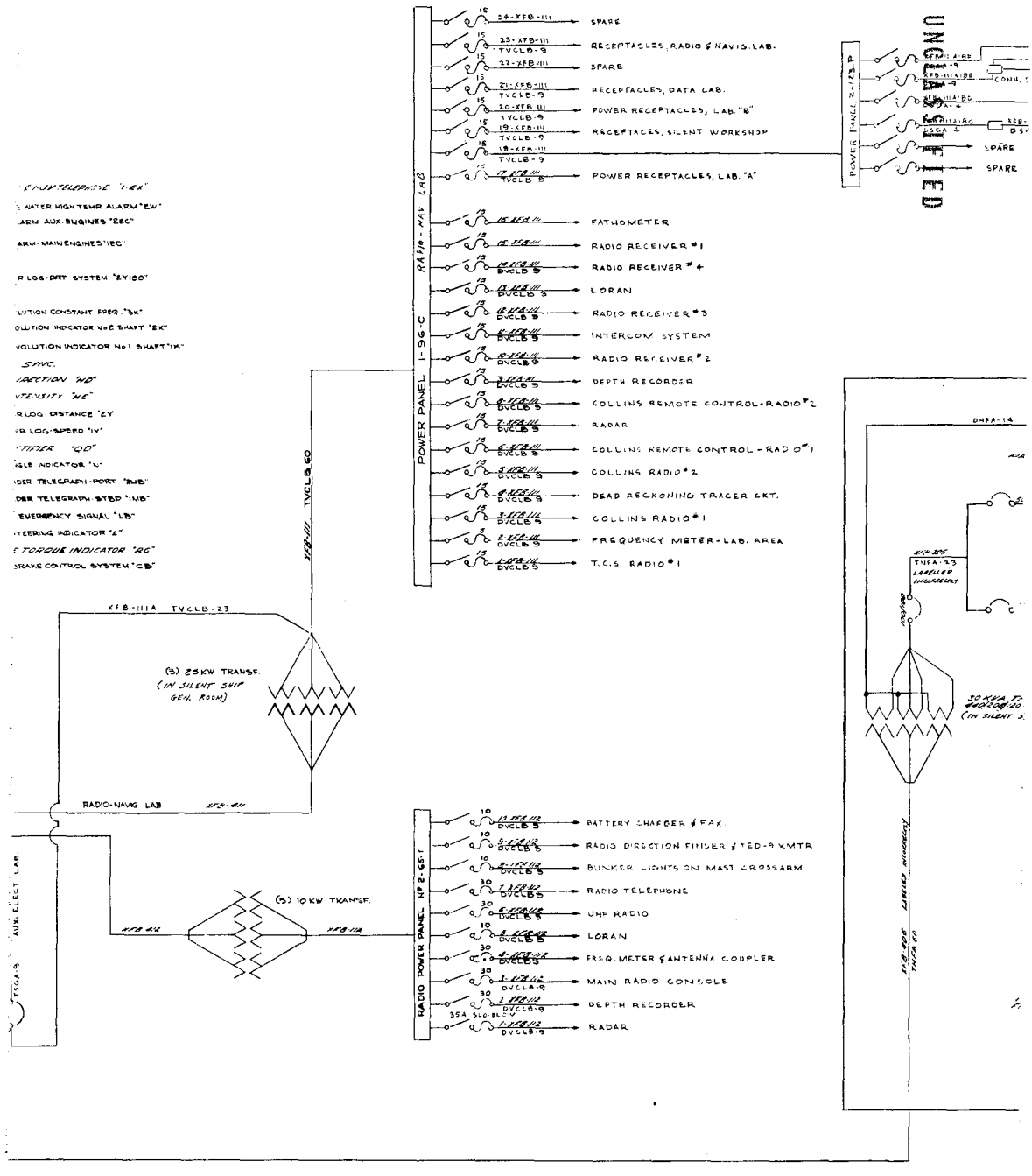
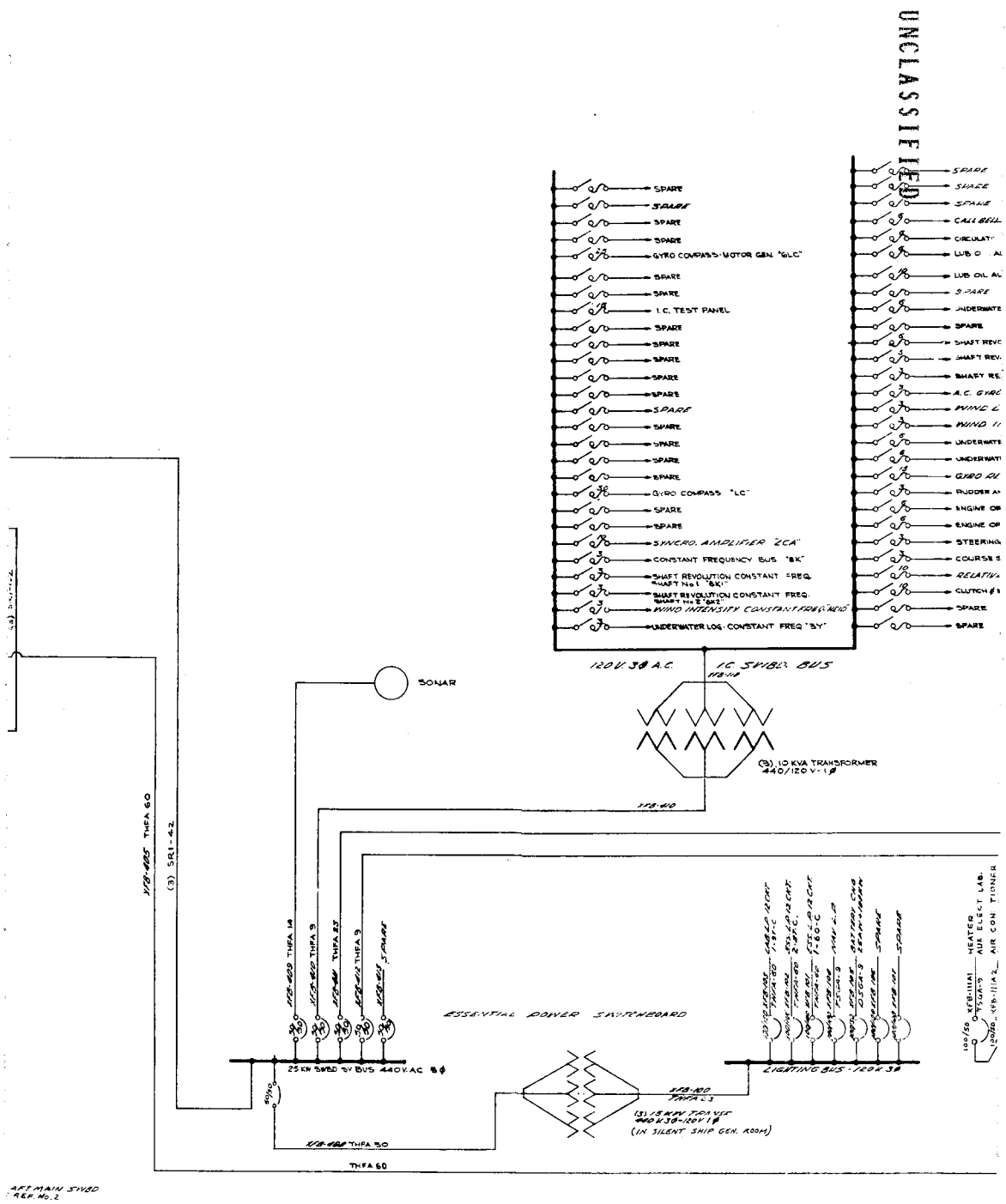




Essential power distribution diagram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GYRO COMPASS - MOTOR GEN. "6LC"
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SHAFT REVOLUTION CONSTANT FREQ. "SHAFT No 1 "8K1"
SHAFT REVOLUTION CONSTANT FREQ. "SHAFT No 2 8K2"
WIND INTENSITY CONSTANT FREQ."WI"
UNDERWATER LOG - CONSTANT FREQ "3Y"
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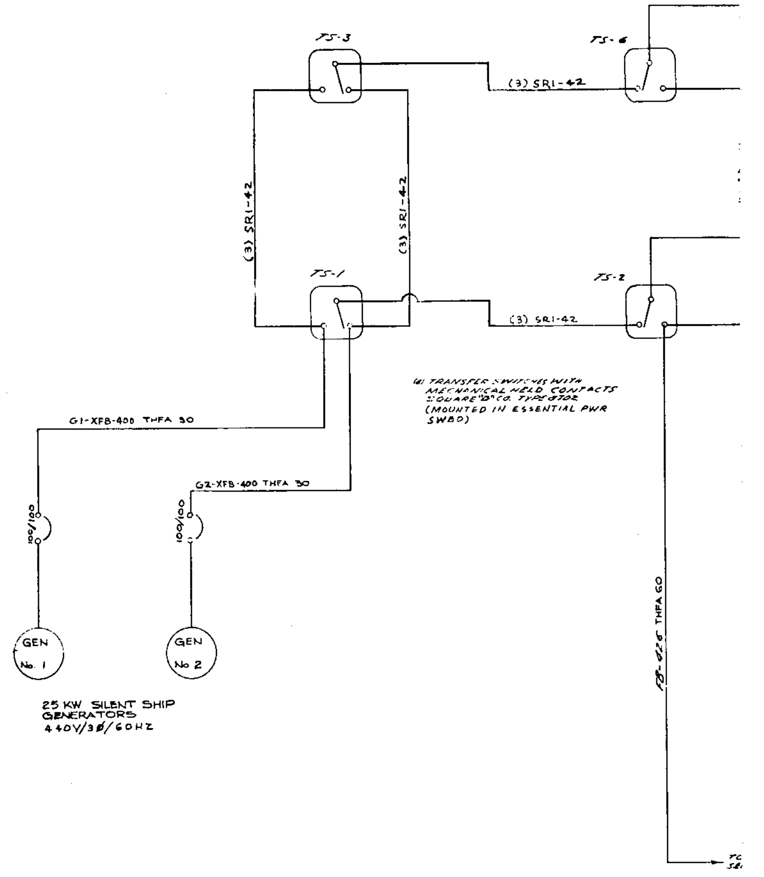
120V 3Ø A.C.
I.C. SWBD. BUS
SONAR
(3) 10 KVA TRANSFORMER 440/120 V-1Ø
XFB-410
XFB-405 THFA 60
(3) SR1-42
XFB-400 THFA 14
XFB-402 THFA 9
XFB-404 THFA 25
XFB-406 THFA 9
XFB-408 SPARE
ESSENTIAL DIVER SWITCHBOARD
25 KW SWBD 6V BUS 440V.AC 6Ø
XFB-100 THFA 3
(3) 15 KW TRANSF 440 W 3Ø-120V 1Ø (IN SILENT SHIP GEN. ROOM)
XFB-401 THFA 30
THFA 60
LIGHTING BUS - 120V 3Ø
SPARE
100/50 KFB-1114 HEATER
75 GA-9 AUX. ELECT. LAB.
20 GA-9 KFB-1112 AIR CONDITIONER
AFT MAIN SWBD REF. NO. 2

Fig. 14 -



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